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ABSTRACT

Project MAS, in its second year of a three year funding cycle (1983-84), is a multi-site program providing instruction in English as a second language and native language arts, and bilingual instruction in math and science. It serves approximately 400 Spanish speaking students of limited English proficiency, in grades 3 through 8 at four Bronx, New York, schools. The funding sources for the project are tax levy, Chapter I, and Title VII. The program includes training sessions for paraprofessionals, resource teachers, project directors, and classroom teachers. Parents are also involved. Program objectives were assessed in English language development, mastery of the native language, and mathematics with the following results: (1) Fourth- and fifth-grade students made significant gains in English; (2) high pre-test scores in Spanish restricted their gains in the native language; however, seventh- and eighth-grade students tested at level 3 of the Spanish Language Assesement Battery did make significant gains; (3) students made significant gains in math in grades three and seven and losses in grade six. The following recommendations are made to improve the program: (1) develop strategies to expand the project in the absence of Title VII funding; (2) expand the concept of language teaching through science and math to other content areas; (3) emphasize small group instruction; (4) adjust future staff development activities to the less receptive classrooms; (5) use a different instrument to measure gains in Spanish; and (6) test student performance in science to determine student progress and evaluate program outcomes. (CG)

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PROJECT MAS

1983-1984

OEA Evaluation Report

O.E.A. Evaluation Section Report

Robert Tobias, Administrator of Evaluation
Judith S. Torres, Senior Manager

Grant Number: G00-820-2689

PROJECT MAS

1983-1984

Project Director:
Barbara Gerard

Prepared by the
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A SUMMARY OF THE REPORT

This multi-site instructional program, in its second year of a three-year funding cycle, provided instruction in English as a second language (E.S.L.) and native language arts, as well as bilingual instruction in mathematics and science to approximately 400 Spanish-speaking students of limited English proficiency (LEP) in grades three through eight. Project MAS was administered centrally by the Office of Bilingual Education of the New York City Board of Education and operated at four sites in the Bronx -- P.S. 27, P.S. 29, I.S. 184, and C.S. 47. Almost 40 percent of the total program enrollment was from the intermediate school; the remaining students were fairly evenly distributed among the three elementary school sites. Twenty-nine percent of the program students were in the sixth grade, making it the grade with the largest number of program participants. Most of the program students were of Puerto Rican background, some born in New York City and others in Puerto Rico. Others were from Cuba, the Dominican Republic, and several other Central and South American countries. Placement in the program was based on students' scores on the Language Assessment Battery (LAB). However, those students scoring above the cut-off LAB score were also eligible for program participation upon parental request. Thus, the students varied in English language proficiency and native language ability.

The project was designed to develop students' English proficiency and to increase their knowledge of science and math. The project emphasizes the functional and communicative aspects of language and incorporates a holistic approach to second language development, whereby students learn the second language by building on communication skills developed in the first. Both Spanish and English are therefore used in instructional situations. Thus, while students are learning basic concepts in math and science, they are also provided opportunities to transfer communicative skills acquired as part of their native language development to English language learning.

Three funding sources supported Project MAS: tax-levy, Chapter I, and Title VII. Title VII funds supported all administrative and support staff, in addition to five paraprofessionals. Instructional services were provided by tax-levy and Chapter I personnel. Curriculum development efforts were geared to science and language development. Development activities for staff members included training sessions for paraprofessionals provided by the project director and resource teachers, on-site training for paraprofessionals provided by the resource teachers, university courses attended by professional and paraprofessional staff, and professional conferences, seminars, and workshops attended by the project director, resource teachers, and classroom teachers. Parents of program students were involved through the Project MAS advisory board and attendance at training sessions.

Program objectives were assessed in English language development (Language Assessment Battery); mastery of the native language (Spanish Language Assessment Battery); and mathematics (New York City Mathematics Test). Quantitative analysis of student achievement data indicates that:

--Fourth- and fifth-grade students made statistically significant gains on the English version of the LAB, Level 2. The gains for students pretested and posttested on Level 3 were also statistically significant.

--Students' high pretest scores restricted the gains made on the Spanish LAB, Level 2. However, those seventh- and eighth-grade students tested on Level 3 did make gains which were statistically significant.

--Students made statistically significant gains on the New York City Mathematics Test in grades three and seven and losses in grade six. Students had mean Normal Curve Equivalent posttest scores over 50 in grades three, four, five, and seven.

The following recommendations are aimed at improving the overall effectiveness of the program:

--developing strategies to expand the project's role in the absence of Title VII funding;

--expanding the concept of teaching language as communication through science and math to other content areas, such as literature and social studies;

--continuing to emphasize small group instruction to facilitate student interaction and cooperation;

--adjusting future staff development activities to the less receptive classrooms at C.S. 47;

--using a different instrument to measure gains in Spanish; and

--testing student performance in science to determine student progress and evaluate program outcomes.

ACKNOWLEDGEMENTS

The production of this report, as of all Office of Educational Assessment Bilingual Education Evaluation Unit reports, is the result of a cooperative effort of regular staff and consultants. In addition to those whose names appear on the cover, Adrian Bennett has reviewed and edited the report, and Ida Heyman coordinated the editing and production process. Patricia Fitzpatrick has spent many hours creating, correcting, and maintaining data files. Finally, Joseph Rivera has worked intensively to produce, correct, duplicate, and disseminate reports. Without their able and faithful participation, the unit could not have handled such a large volume of work and still produced quality evaluation reports.

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LANGUAGE LEARNING THROUGH MATHEMATICS AND SCIENCE INSTRUCTION
PROJECT MAS

Headquarters:	131 Livingston Street Brooklyn, New York 11201
Year of Operation:	1983-84, second year of a three-year cycle
Target Language:	Spanish
Number of Students:	393
Project Director:	Barbara Gerard
Sites:	P.S. 27, P.S. 29, I.S. 184 (Community School District 7); and C.S. 47 (Community School District 12)

I. OVERVIEW

In its second year of funding, Project MAS continued to provide instructional services to 393 students of limited English proficiency (LEP) in grades three through eight. The program emphasizes language learning through concentrated instruction in mathematics and science. It is administered centrally by the Office of Bilingual Education (O.B.E.) of the New York City Board of Education, and it serves four different school sites in the Bronx -- P.S. 27, P.S. 29, I.S. 184, and C.S. 47.

Three of the targeted schools are located in Community School District (C.S.D.) 7. P.S. 27 is an elementary school encompassing kindergarten through sixth grade. In 1983-84, it had a total enrollment of 518 pupils of whom 99 percent were eligible for free lunch. The school's ethnic composition was reported to be 85 percent Hispanic and

15 percent black, which reflects a slight increase in the proportion of Hispanics to blacks from the previous year. Approximately one third of the total number of students were LEP. In 1983-84, as in the previous year, grades four, five, and six participated in Project MAS.

The majority of students enrolled at P.S. 29 and I.S. 184 are Hispanic and black (exact percentages were not reported). At P.S. 29 nearly 86 percent of the students come from homes with poverty level incomes and more than 20 percent of the school's total enrollment are LEP. Students in third, fourth, and fifth grade were eligible to participate in Project MAS.

I.S. 184 serves grades six, seven, and eight; all of these grades participated in Project MAS. During 1983-84 there were 686 students enrolled in the school; 88 percent were reported to be free-lunch eligible. Hispanics comprise 84 percent of the school population; 21 percent of the Hispanics are classified as LEP.

Community School 47, located in C.S.D. 12, encompasses kindergarten through sixth grade. Seventy percent of the students are Hispanic; of these, 19 percent are LEP. Grades four, five, and six participated in Project MAS.

In 1983-84, the program was fully staffed and implemented as planned. In addition to the previous year's Title VII staff which included a project director, a mathematics resource teacher, a parent trainer, and five bilingual paraprofessionals, the project was successful in recruiting a science resource teacher to fill the position left vacant in 1982-83.

The project also made use of the services of 14 full-time and three part-time tax-levy teachers and two part-time reading teachers, whose positions were funded by Chapter I.

II. STUDENT CHARACTERISTICS

ENTRY CRITERIA

Project students were selected in the same manner as in the previous year. Program services were offered to schools with high concentrations of eligible students who scored below the twenty-first percentile on the English Language Assessment Battery (LAB) and who obtained higher percentile scores on the Spanish LAB than on the English LAB. In addition, students who were referred by their parents, regardless of their test scores, were also included. Thus, the students participating in Project MAS varied in English language proficiency and native language ability.

COMPOSITION

Project MAS served 393 students in grades three through eight during 1983-84: 77 students at P.S. 27; 63 students at P.S. 29; 171 students at I.S. 184; and 82 students at C.S. 47. See Table 1 for the distribution of project students for whom information was reported, by grade level, by school site.

Most pupils were of Puerto Rican background, some born in New York City and others in Puerto Rico. The remaining students were from Cuba, Ecuador, the Dominican Republic, Honduras, Nicaragua, and other Central American countries.

TABLE 1

Distribution of Program Students by Site and Grade

	--------District 7--------			District 12		
Grade	P.S. 27	P.S. 29	I.S. 184	C.S. 47	Total	Percent
3	0	23	0	0	23	6
4	25	23	0	21	69	18
5	23	11	0	30	64	17
6	28	0	53	29	110	29
7	0	0	53	0	53	14
8	0	0	62	0	62	16
TOTAL	76	57	168	80	381*	
PERCENT	20	15	44	21	100	

*The breakdown by grades does not add up to 393 due to missing or incorrect data on grade.

- Of all sites, I.S. 184 had the most students (44 percent) participating in the project.
- Twenty-nine percent of the program students were sixth graders.
- Only six percent of the students were in the third grade and were located at only one site -- P.S. 29.

III. PROGRAM DESCRIPTION

PROGRAM OBJECTIVES

Following is the list of objectives as stated in the evaluation design of the project proposal.

1. As a result of participating in the program, at least 75 percent of the target student population will demonstrate a significant increase ($p < .05$) in understanding skills in English as measured by a comparative analysis of pretest and posttest raw and percentile scores on the understanding language subtest of the Language Assessment Battery.

2. As a result of participating in the program, at least 75 percent of the target student population will demonstrate a significant increase ($p < .05$) in reading skills in English as measured by a comparative analysis of pretest and posttest raw and percentile scores on the Language Assessment Battery, Levels 2 and 3.

3. As a result of participating in the program, at least 75 percent of the target student population will demonstrate a significant increase ($p < .05$) in writing skills in English, as measured by a comparative analysis of pretest and posttest raw and percentile scores on the Language Assessment Battery, Levels 2 and 3.

4. As a result of participating in the program, at least 75 percent of the target student population will demonstrate a significant increase ($p < .05$) in Spanish language arts, as measured by a comparative analysis of pretest and posttest raw and percentile scores on the Spanish Language Assessment Battery, Levels 2 and 3.

5. As a result of participating in the program, at least 75 percent of the target student population will demonstrate a significant increase ($p < .05$) in mathematics concepts and skills in the native language, as measured by a comparative analysis of pretest and posttest raw and percentile scores on the New York City Mathematics Test.

6. As a result of participating in the program, at least 75 percent of the target student population will demonstrate a significant increase ($p < .05$) in science concepts and skills in the native language as measured by a comparative analysis of pretest and posttest raw scores on a locally-developed science test.

7. By the end of the second year of the project, the resource teacher, assisted by selected bilingual teachers, will develop 15 instructional science units that will be integrated within existing bilingual education curriculum for LEP students, as evident in the examination of 15 instructional packets.

8. Paraprofessionals in Project MAS will participate in a minimum of 10 training workshops offered by project staff aimed at enhancing their skills for teaching students of limited English proficiency. A content analysis will be performed of the following data sources:

    a. list of workshop topics;
    b. copies of materials distributed at workshops;
    c. lists of attendance;
    d. participants' evaluation forms.

9. Paraprofessionals in the program will enroll in a degree-granting bilingual education program at an institution of higher education in New York State. They will register for at least two courses in such programs.

10. Bilingual teachers in the program will register and attend a credit-bearing mini-course in science education and a credit-bearing mini-course in mathematics education, taught through an institution of higher education in New York State. A content analysis will be performed of the descriptions of each course, and the attendance records will be examined.

11. Participating bilingual teachers in the program will increase their mastery of teaching strategies for math and science instruction as measured by a self-report questionnaire.

12. Participating paraprofessionals in the program will increase their mastery of teaching strategies for mathematics and science, measured by teachers' assessment of their development as reported in a questionnaire.

13. At least 25 percent of the parents of pupils in the program will participate in a minimum of one project-sponsored parental activity as measured by attendance records for activities.

PROJECT DESIGN

Project MAS is designed to serve two major needs of program students -- to develop their English proficiency, and to increase their knowledge

of science and math. The project emphasizes the functional and communicative aspects of language and incorporates a holistic approach to second language development, whereby students learn the second language by building on communication skills developed in the first language. This process is facilitated by placing LEP students in classrooms where they have opportunities to communicate with students with varying degrees of English proficiency. Content in both science and math provides the communicative focus of such classes. Thus, while students are learning basic concepts of problem solving they are also provided opportunities to transfer communicative skills acquired as part of their native language development to English language learning. Both Spanish and English are therefore used in instructional situations. Just as importantly, through this holistic approach to language development, students who are English proficient learn that math and science concepts can also be expressed in Spanish.

In order to achieve these major goals, the Project MAS design also incorporates the development of bilingual math and science instructional units, the use of educational assistants to support math and science instruction, the provision for Title VII resource rooms at all sites, staff development and training, and parental involvement.

ORGANIZATION AND STRUCTURE

The program director is responsible for the implementation of proposed activities. Her responsibilities include administrative, supervisory, and fiscal matters pertaining to the program. She reports to

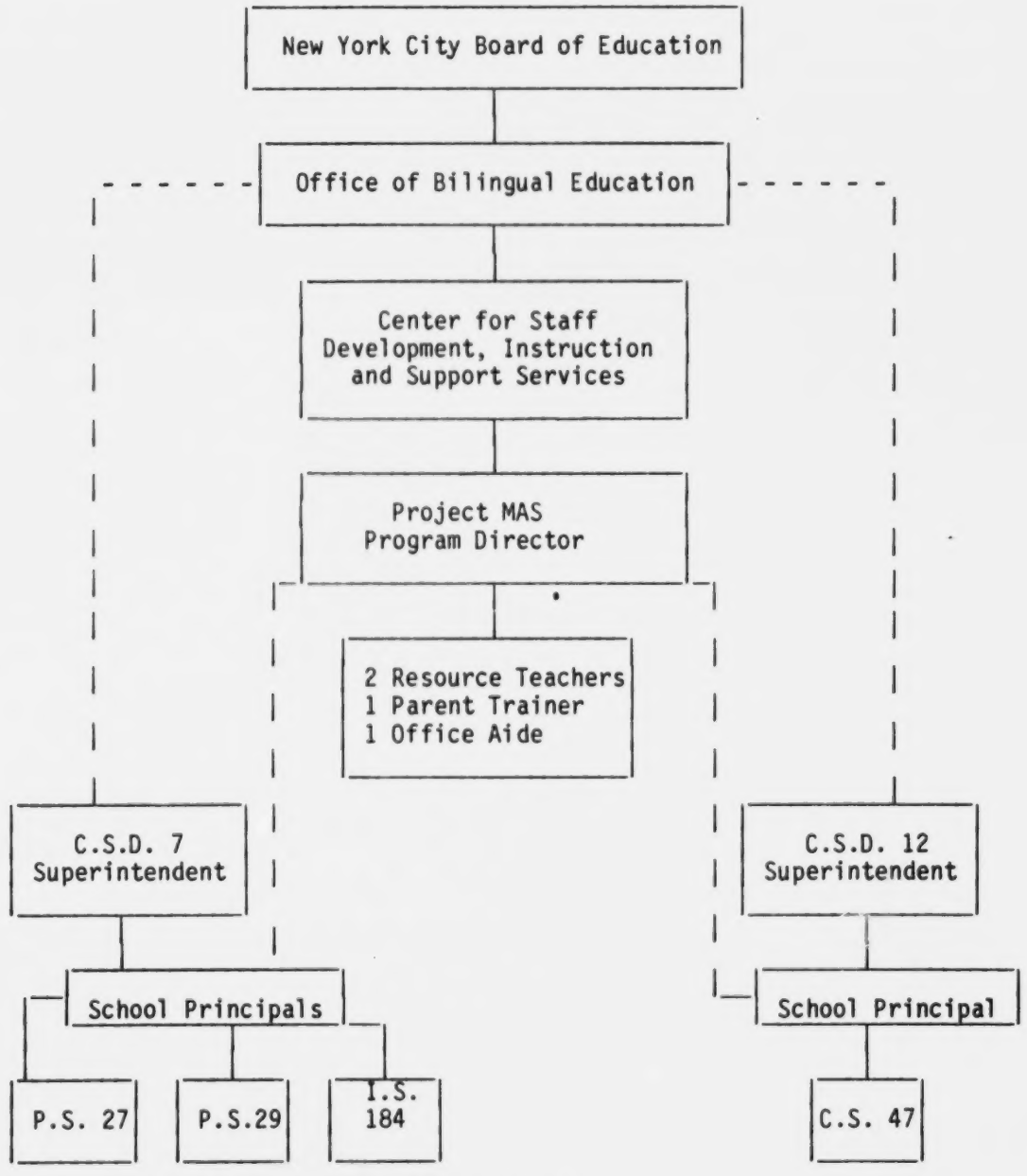
the director of the Center for Staff Development, Instruction and Supportive Services at the Office of Bilingual Education (O.B.E.). Directly under her supervision is the Title VII staff consisting of two resource teachers, one parent trainer, and one office aide.

Official communication regarding Project MAS goes from the director of O.B.E. to the superintendents of C.S.D. 7 and 12 and site principals. Communication pertains primarily to planning, funding, changes in approved activities, and testing requirements. The program director communicates directly with site principals on matters related to the implementation of approved program activities.

The principals, with the support of appropriate supervisory staff, supervise the instructional staff at their individual sites. Figure 1 summarizes Project MAS' organizational arrangement within the multi-site structure.

FIGURE 1

Organization and Structure of Project MAS



FUNDING

Three funding sources support the operation of Project MAS: tax levy, Chapter I, and Title VII. Table 2 presents information on funding for the instructional component, indicating that the positions of program teachers are supported by a combination of Chapter I and tax-levy funds. Fourteen tax-levy teachers are assigned to program students on a full-time basis, and three reading teachers spend 20 percent of their time instructing program students. Two Chapter I reading teachers are assigned 20 percent of their time to Project MAS. Five Title VII educational assistants provide direct instruction to program pupils for 80 percent of their time and attend training sessions provided by program staff for the remaining time. Title VII also supports the positions of the program director, two resource teachers, one parent trainer, and one office aide.

STAFF CHARACTERISTICS

Appendix A summarizes the characteristics of central support professional and paraprofessional staff. The project director and two resource specialists have extensive experience in education in general and in bilingual education in particular. Each possesses appropriate licenses and certification in administration, science, and math. Each has a graduate degree in professional education. One paraprofessional has 10 years' experience in education, seven of those being specifically in bilingual education. All five paraprofessionals are enrolled in university degree programs, and have earned several education credits.

TABLE 2

Funding of Instructional Staff by School Site

Position	Funding Source	Portion of Time Assigned to Program
P.S. 27		
1 Bilingual Teacher (4th grade)	Tax-levy	100%
1 Bilingual Teacher (5th grade)	Tax-levy	100%
1 Bilingual Teacher (6th grade)	Tax-levy	100%
1 Reading Teacher	Chapter I	20%
3 Reading Teachers	Tax-levy	20%
1 Bilingual Ed. Assistant	Title VII	80% (teaching) 20% (in training)
P.S. 29		
1 Bilingual Teacher (3rd grade)	Tax-levy	100%
1 Bilingual Teacher (4/5th grade)	Tax-levy	100%
1 Reading Teacher	Chapter I	20%
1 Bilingual Ed. Assistant	Title VII	80% (teaching) 20% (in training)
I.S. 184		
3 Mathematics Teachers	Tax-levy	100%
2 Science Teachers	Tax-levy	100%
1 Gates Teacher	Tax-levy	100%
2 Bilingual Ed. Assistants	Title VII	80% (teaching) 20% (in training)
C.S. 47		
1 Bilingual Teacher (4th grade)	Tax-levy	100%
1 Bilingual Teacher (5th grade)	Tax-levy	100%
1 Bilingual Teacher (6th grade)	Tax-levy	100%
1 Bilingual Ed. Assistant	Title VII	80% (teaching) 20% (in training)

IV. INSTRUCTIONAL COMPONENT

The instructional design for Project MAS calls for the holistic integration of science and mathematics content with the students' language learning experiences. The concepts, processes, and terms of science and math serve as the topics of focus for communicative situations in which both Spanish and English skills are being developed. This approach is intended to convey to LEP students the understanding that the same communicative functions -- to initiate topics, to make comments, to make requests, to negotiate interpersonal relationships, etc. -- can be accomplished through either language.

RESOURCES OF THE PROJECT

Project MAS provides the structure, materials, staff, and other resources to facilitate the accomplishment of this instructional philosophy. New materials, including commercial ones, were adapted for use in the program. Project staff also developed various curriculum units, and created resource rooms or learning centers at each of the four sites.

The project also created self-contained resource rooms for math and science learning at two sites, P.S. 27 and P.S. 29. Due to space limitations at C.S. 47 and I.S. 184, learning centers were created in the back of classrooms. All resource rooms and learning centers were well equipped with a variety of materials for math and science lessons. These materials included microscopes, telescopes, incubators, rulers, games, animal cages, batteries, as well as instructional materials on

particular content themes, such as banking, metrics, sets and subsets. Plans are underway for establishing a third resource room at P.S. 29, which will implement an important component of Project MAS: the "South Bronx Reconstruction Project" (see page 19).

The five paraprofessionals were assigned to the various sites four days per week to assist teachers. Two educational assistants were assigned to I.S. 184, and one educational assistant to each of the other three sites. In addition, the project's resource specialists spent one day a week at each site consulting with teachers, providing demonstration instruction, and acting as liaison between the site and the project headquarters.

IMPLEMENTATION OF INSTRUCTIONAL GOALS

English as a second language, English reading, native language, and bilingual mathematics and science instruction were offered at each of the four Project MAS sites. Bilingual instruction was provided by at least two, and in most cases three, teachers in math and science at all sites, with the assistance of the paraprofessionals.

A member of the evaluation team visited each site. It was noted that P.S. 27 teachers used the resource rooms sporadically and less frequently, than at other sites. Teachers at all other sites were actively engaged in the use of materials in the resource rooms or learning centers. Staff at I.S. 184 had advanced beyond routine use of these resources and were beginning to develop improved implementation of the project's instructional objectives, modifying the use of materials to

suit the needs of their particular students. Implementation at P.S. 27 and P.S. 29 was also being carried forward, though in a more routine application of the project philosophy. It was noted that learning centers in the classrooms were used more frequently than the separate resource rooms.

A member of the evaluation team observed a fifth-grade math class at P.S. 27, and a fourth-grade science class at P.S. 29. Activities observed in these classes illustrate well the specific application of Project MAS instructional methodology.

For the fifth-grade math class, the objective was to teach concepts of measurement by means of "hands-on" use of concrete materials. At the beginning of the period, the teacher used Spanish to state the objectives of the lesson and to explain the nature of the activities they would be engaged in. The class was then divided into four separate groups, each focusing on a particular theme. For example, one group had to use rulers to measure a set of objects. The written materials used in the lesson were in English. Specific demonstrations of the use of materials, and questions and responses by both teachers and students alternated between Spanish and English. A paraprofessional assisted in guiding the groups and helping individual students understand the lesson. At least 75 percent of the students were actively engaged in lesson-related activities throughout this instructional period.

The teacher of the fourth-grade science class at P.S. 29 made the science materials available in such a way that students could select among a range of scientific activities in completing their assignment. The general goal of the lesson observed was to understand electricity

and its various operational properties. Again, "hands on" use of concrete materials was encouraged. The teacher also encouraged students to use either language, thus allowing features of the specific context to determine language choice of the moment. Students were therefore placed in motivating situations where they could select freely the use of materials, as well as the language of their choice. Throughout the lesson, then, both Spanish and English could be heard. The holistic approach to language learning was thus fully and creatively implemented in this class. At least three-fourths of the students were actively participating in lesson-related activities throughout the period. The educational assistant continually moved about the classroom assisting individual students. There was consensus among these various personnel that student enthusiasm is good and is increasing.

V. NON-INSTRUCTIONAL COMPONENT

CURRICULUM DEVELOPMENT

Curriculum materials and instructional units were being developed this year in science and language development. Science modules were originated by project staff, while existing materials for science and language development are being adapted from English into Spanish. All materials parallel mainstream curriculum materials.

STAFF DEVELOPMENT

During 1983-1984, Project MAS staff participated in four types of staff development activities: a series of training sessions for paraprofessionals provided by the project director and resource teachers at the central office; on-site training of paraprofessionals provided by the resource teacher; university courses attended by professional and paraprofessional staff; and professional conferences, seminars, and workshops organized by various support service agencies in New York and attended by the project director, resource teachers, and classroom teachers.

The program paraprofessionals report one day per week to the central office to participate in a series of training sessions. The following topics were covered in these sessions during the 1983-84 school year: "holistic planning -- how and why"; a science mini-course; workshops on art and science; sample E.S.L. lessons; various math concepts; and the development of lesson plans to be used in the South Bronx Reconstruction Project.

In addition to these training sessions, paraprofessionals and participating teachers took three university "mini-courses" specifically designed for Project MAS: Microcomputers in Bilingual Education, Language Learning Through Mathematics, and Language Learning Through Science. These courses were offered at the City College, City University of New York.

Paraprofessionals interviewed concurred in their positive assessment of this training. They found the presentations well organized and effective, and considered that the topics discussed and the materials distributed were useful in carrying out their program responsibilities.

The in-service program provided by the resource specialists focussed on demonstration and coaching in the transfer of skills to the classroom. The program included the presentation of theory and applications to classroom situations; the demonstration of skills and teaching models with groups of children; coaching and practice of skills; and constructive evaluation.

Several program teachers reported that as a consequence of participating in Project MAS staff development activities, they had improved their presentations of mathematics and science instructional materials, established and maintained student interest in instruction, and improved methods of monitoring students' progress. They also reported improvement in instructional strategies among paraprofessionals, and attributed these to in-school and outside school program training.

CULTURAL ENRICHMENT ACTIVITIES

Various cultural enrichment activities were offered during the 1983-84 year, involving the participation of students, parents, and project staff. One example is the South Bronx Reconstruction Project initiated at P.S. 29. Sixty-two children in grades three through six are involved. According to a description written by the project director, this program, "through various, carefully planned activities, integrates the children's learning process... The children have begun to measure and map routes of their area. They have begun to look at the buildings in terms of their architectural uniqueness and historical perspectives designating them for landmark preservation, etc."

PARENTAL INVOLVEMENT

Three major strategies were used by Project MAS staff to involve program students' parents in matters related to their children's education. Project staff sought parental advice on educational issues by encouraging participation at program and citywide advisory organizational levels. Staff offered training on the role of parents in the educational process through classes and workshops held at each site, as well as the city-wide conferences. Other services, such as referrals or translation, were provided to individual parents upon request.

Training sessions for parents at each school site were primarily organized and delivered by the parent trainer under the supervision of the project director and with the assistance of a resource teacher. The trainer spent one day each week per site, and she stated that parental activities at each school varied according to parents' needs. For example,

at one site, parents were given sessions of leadership training aimed at increasing their active participation in the Parent Teacher Association. Workshops were given on the importance of homework, teenage problems, and drug abuse. A similar pattern was followed at other sites. Weekly exercise and diet and nutrition classes were also provided, as well as individual services such as referrals to social service agencies, writing letters in English, and translations.

VI. STUDENT ACHIEVEMENT

The following section presents the assessment instruments and procedures used in evaluating student attainment of the program objectives proposed.

ASSESSMENT PROCEDURES AND INSTRUMENTS

Students were assessed in English language development, native language development, and mathematics achievement. The following are the program's instructional objectives and the assessment instruments used to determine student achievement:

Objective	Assessment Instrument
Significant increase in understanding, reading, and writing skills in English.	Language Assessment Battery (LAB), English, Levels 2 and 3
Significant increase in Spanish language arts skills.	Language Assessment Battery, Spanish, Levels 2 and 3
Significant increase in math concepts and skills.	New York City Mathematics Test (N.Y.C.M.T.)

These instruments were administered once each academic year on a city-wide basis. To assess program students' achievement, a correlated *t*-test was computed using the students' scores from the previous year (spring, 1983) as the pretest and their most recent scores (spring, 1984) as the posttest. This statistical analysis demonstrates whether the difference between pretest and posttest mean scores (gain) is significantly greater than would be expected from chance variation alone.

"Effect size" (E.S.) was calculated following the procedure recommended by Cohen.* An effect size for correlated t-test is an estimate in standard deviations of the difference between means. Unlike the standard t-test, the E.S. is less affected by sample size. It is desirable to establish such an estimate because substantial differences in performance frequently fail to reach statistical significance if the sample size is small. Conversely, small differences may be deemed as statistically significant if the sample size is large. The E.S. provides additional substance to the analysis as it may be interpreted in light of Cohen's recommendations:

.20 = small effect size

.50 = moderate effect size

.80 = large effect size

Two instruments were used to assess pupil achievement: the New York City Mathematics Test and the Language Assessment Battery. The New York City Mathematics Test is designed to measure competence in three interrelated areas of mathematics: concepts of numeration, skill in computation, and application of concepts. The primary purpose of the test is to determine specific areas in which the student is experiencing difficulty. There is a test level for each grade.

The Language Assessment Battery is a series of tests developed by the New York City Public Schools to identify LEP students. The items for the English subtests were selected to provide sufficient "floor" and "ceiling" for LEP students. The tests were normed on the New York City

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*J. Cohen, Statistical Power Analysis for the Behavioral Sciences, Academic Press, 1969.

Public School population and measure listening, reading, and writing skills for kindergarten through grade twelve. There are four vertically equated levels with two forms per level.

	Grade
Level 1	K-2
Level 2	3-5
Level 3	6-8
Level 4	9-12

The Spanish LAB has items similar to those on the English LAB and is divided into the same four levels. The attempt was to design subtests which are equivalent across languages. The Spanish LAB was normed on New York City Public School students with Hispanic surnames. More information on the psychometric properties of the LAB may be obtained from the New York City Public Schools.*

ENGLISH LANGUAGE ACHIEVEMENT

Due to missing or incorrect data on grade, raw score, or test level, pretest and posttest LAB scores were available for 221 of the 393 students.

-- 83 students were pretested and posttested at Level 2 (grades four and five);

-- 87 students were pretested and posttested at Level 3 (grades seven and eight);

-- 11 third-grade students were pretested at Level 1 (grade two) and posttested at Level 2 (grade three); and

-- 40 sixth-grade students were pretested at Level 2 (grade five) and posttested at Level 3 (grade six) because students are tested only in the spring.

*Office of Educational Assessment, 110 Livingston Street, Brooklyn, New York 11201.

The English LAB was developed as a screening instrument rather than an achievement measure, and was purposely made to be very easy for native speakers of English. Therefore, the percentile distribution is highly distorted. For example, for fifth grade, raw scores from zero to 72 correspond to the first through the twentieth precentile, while raw scores from 73 to 87 correspond to the twenty-first through the ninety-ninth percentile. It is quite possible for a student to gain 35 raw score points and remain at the first percentile. Therefore, percentiles, normal curve equivalents, and scale scores were not used.

A t-test was performed for those students who had complete pretest and posttest raw scores on the same test level; the results are presented in Tables 3 and 4. Means and standard deviations are reported in Table 5 for those third- and sixth-grade students who were pretested and post-tested on different test levels. Gain scores could not be computed for these students who changed levels because scaled scores were not available.

The data on Table 3 show that students in fourth and fifth grades made statistically significant gains. Overall, fourth graders made greater gains in all areas, particularly in the reading subtest. The effect size for this group was generally large, while it was generally moderate for fifth graders.

All gains for students pretested and posttested on Level 3 (Table 4) were also statistically significant. Eighth-grade students generally made larger gains than seventh-grade students. The effect size for eighth graders was generally large, while it ranged from moderate to large for seventh graders.

Gains could not be computed for third and sixth graders who changed levels. Means and standard deviations are reported in Table 5.

TABLE 3

English Language Achievement

Significance of Mean Total Raw Score Differences Between Initial and Final Test Scores of Students with Full Instructional Treatment on the Language Assessment Battery, Level 2, by Grade

(Grades 4 and 5)

Grade	Subtest	N	Pretest Mean	Pretest Standard Deviation	Posttest Mean	Posttest Standard Deviation	Mean Difference	Effect Size
4	Listening	50	17.9	6.5	23.6	5.6	5.6**	0.9
	Reading	50	13.8	8.3	21.4	8.3	7.6**	1.1
	Writing	43	7.5	3.8	10.7	4.0	3.1**	0.8
5	Listening	33	18.2	9.8	22.7	6.8	4.5**	0.6
	Reading	31	17.2	11.4	22.5	9.6	5.3**	0.5
	Writing	28	9.5	5.7	12.4	4.9	2.9**	0.6

**Statistically significant at the .01 level.

TABLE 4

English Language Achievement

Significance of Mean Total Raw Score Differences Between Initial and Final Test Scores of Students with Full Instructional Treatment on the Language Assessment Battery, Level 3, by Grade

(Grades 7 and 8)

			Pretest		Posttest			
Grade	Subtest	N	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	Effect Size
7	Listening	31	16.2	7.6	20.0	6.8	3.7**	0.7
	Reading	20	15.6	7.9	20.4	8.2	4.8**	0.5
	Writing	39	9.1	5.4	12.6	4.8	3.5**	0.9
8	Listening	35	18.3	6.9	23.3	6.4	5.0**	1.1
	Reading	20	20.1	7.8	25.4	7.5	5.3**	0.8
	Writing	48	11.8	4.3	13.8	3.7	2.0**	0.7

**Statistically significant at the .01 level.

TABLE 5

English Language Achievement

Results of the Language Assessment Battery
By Grade, Subtest, and Test Level

Grade 3

Subtest	N	Pretest Level 1 Mean	Pretest Level 1 Standard Deviation	Posttest Level 2 Mean	Posttest Level 2 Standard Deviation
Listening	11	19.3	7.7	19.9	5.6
Reading	11	15.6	7.7	15.3	8.8
Writing	4	7.0	0.8	11.0	3.6

Grade 6

Subtest	N	Pretest Level 2 Mean	Pretest Level 2 Standard Deviation	Posttest Level 3 Mean	Posttest Level 3 Standard Deviation
Listening	30	18.7	6.1	21.3	6.5
Reading	30	24.4	7.2	28.2	8.9
Writing	40	10.0	5.5	13.0	4.3

Note: Because the tests are at different levels, the number of items increases by level, and the difficulty of items also increases. Therefore, gains can not be computed.

NATIVE LANGUAGE ACHIEVEMENT

Complete Spanish LAB data were available for 224 of the 393 students reported:

-- 78 students were pretested and posttested at Level 2 (grades three to five);

-- 95 students were pretested and posttested at Level 3 (grades six to eight);

-- 6 third-grade students were pretested at Level 1 (grade two) and posttested at Level 2 (grade three);

-- 45 sixth-grade students were pretested at Level 2 (grade five) and posttested at Level 3 (grade six).

Table 6 presents the native language gains for fourth- and fifth-grade students. Gains were statistically significant only for fourth graders in listening and in writing. Native language gains attained in fourth and fifth grades were not as high as those attained in English; the effect sizes were much lower. One reason for this appears to be a ceiling effect. The maximum attainable scores on the subtests are: 30 in listening, 36 in reading, and 20 in writing. Students in grade four, for example, had a mean pretest score of 26 in listening, which allows for a maximum gain of only four points since the ceiling is 30. Another reason is the sample size which affects the value of t and the degrees of freedom. The small gains attained in native language may not reflect a lack of achievement, but rather that students excelled at pretest.

The gains in listening and reading for seventh and eighth graders were less restricted than gains for fourth and fifth graders because of the higher subtest ceilings at Level 3. Maximum subtest scores are: 38 in listening, 55 in reading, and 20 in writing. Gains in these areas were statistically significant. The gains for eighth graders on the

writing subtest were restricted by the low ceiling of 20 on this subtest; however, students showed small but statistically significant gains.

As with the English test scores, gains could not be computed for third and sixth graders pretested and posttested at different levels on the native language subtests.

TABLE 6

Native Language Achievement

Significance of Mean Total Raw Score Differences Between Initial and Final Test Scores of Students with Full Instructional Treatment on the Language Assessment Battery, Level 2, by Grade

(Grades 4 and 5)

			Pretest		Posttest			
Grade	Subtest	N	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	Effect Size
4	Listening	49	25.8	3.5	27.9	2.0	2.1**	0.6
	Reading	48	24.8	7.4	28.6	5.7	3.8**	0.5
	Writing	44	13.4	5.6	14.6	5.5	1.2	0.2
5	Listening	28	27.8	3.1	28.4	3.1	0.6	0.2
	Reading	29	29.2	7.3	30.0	7.4	0.7	-
	Writing	25	15.8	4.8	17.0	4.8	1.2	0.4

**Statistically significant at the .01 level.

TABLE 7

Native Language Achievement

Significance of Mean Total Raw Score Differences Between Initial and Final Test Scores of Students with Full Instructional Treatment on the Language Assessment Battery, Level 3, by Grade

(Grades 7 and 8)

			Pretest		Posttest			
Grade	Subtest	N	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	Effect Size
7	Listening	38	29.0	5.5	33.0	4.2	4.0*	0.8
	Reading	38	30.8	10.8	42.8	8.6	12.0**	1.1
	Writing	33	14.8	4.0	16.1	4.0	1.2	0.3
8	Listening	57	33.0	3.8	34.3	2.1	1.3**	0.4
	Reading	57	44.5	9.1	49.0	6.3	5.5**	0.7
	Writing	57	17.4	1.9	18.0	2.1	0.6**	0.4

*Statistically significant at the .05 level.

**Statistically significant at the .01 level.

TABLE 8

Native Language Assessment

Results of the Language Assessment Battery (Spanish)
By Grade, Subtest, and Test Level

Grade 3

Subtest	N	Pretest Level 1 Mean	Pretest Level 1 Standard Deviation	Posttest Level 2 Mean	Posttest Level 2 Standard Deviation
Listening	6	25.0	5.5	23.5	3.5
Reading	6	22.5	6.3	19.3	10.3
Writing	2	8.5	0.7	8.0	2.8

Grade 6

Subtest	N	Pretest Level 2 Mean	Pretest Level 2 Standard Deviation	Posttest Level 3 Mean	Posttest Level 3 Standard Deviation
Listening	37	28.9	4.3	31.0	4.0
Reading	45	36.7	6.9	38.5	9.4
Writing	37	16.1	3.2	14.5	3.9

MATHEMATICS ACHIEVEMENT

Complete mathematics achievement data were available for 252 students who took the New York City Mathematics Test in English (see Table 9). Raw scores were converted to Normal Curve Equivalent (N.C.E.) scores which have a mean of 50 and a standard deviation of approximately 21. N.C.E. gains greater than seven have been considered exemplary for Chapter I programs.

Overall, student performance was inconsistent across grades. Fourth and seventh graders made significant gains of over 4 N.C.E.'s. However, sixth graders demonstrated losses that were moderately large and statistically significant. Fifth and eighth graders also demonstrated losses, but these were small and not statistically significant. Third graders virtually did not change in scores from pretesting and posttesting.

The pretest and posttest N.C.E. scores provide a relative view of student achievement. The mean N.C.E. score for the norm group is 50; therefore students exceeding this mean are achieving above national norms. Students in third through fifth grades had exceeded this mean at pretest. When this occurs, individuals scoring very high at pretest tend to move closer to the group mean at posttest. In the case of fifth graders, the mean (57.5) at pretest was high enough to result in some students regressing to the mean and causing a mean decline at posttest. However, in the case of fourth graders, the mean (54) at pretest was high and the group still showed gains. This inconsistent performance across grade levels can not be explained with the data available.

In grade six, the mean dropped by four points but the standard deviation also dropped by five points, which means that students were scoring more similarly at posttest. These results indicate that the scores of some students were very high at pretest and regressed to the mean of the group tested.

TABLE 9

Mathematics Achievement

Significance of Mean Normal Curve Equivalents Between Initial and Final Test Scores of Program Students with Full Instructional Treatment on the New York City Mathematics Test, by Grade

		Pretest		Posttest			
Grade	N	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	Effect Size
3	16	52.1	14.6	52.0	15.6	-0.1	.0
4	51	54.0	15.5	59.1	18.2	5.1*	.3
5	42	57.5	17.5	55.6	16.9	-1.9	-.2
6	62	47.4	18.1	43.3	12.7	-4.1*	-.3
7	30	46.5	16.2	50.8	14.6	4.3**	.6
8	51	41.6	15.3	40.5	12.8	-1.1	-.1

*Significant at the .05 level.

**Significant at the .01 level.

VII. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

The evaluation data suggest that Project MAS is making progress in meeting its goals. There is a positive attitude toward the project among staff, students, and parents. Although the project director felt the program philosophy, particularly the communicative approach to language development, needed better articulation, there was a consensus among principals, participating teachers, and project staff that the philosophy which guides the project has become clearer to all and was more strongly expressed in the current year. In addition, the two classrooms observed by a member of the evaluation team exemplified full and creative implementation of the project's language philosophy and instructional methodology.

All participating staff concurred that the various training activities were highly useful in helping them understand and implement the project design. Support services in general were highly effective in achieving the goals the project set for its second year of operation.

The results of student performance on tests used for evaluation indicate that MAS students are generally making statistically significant gains in English and Spanish, and at two grade levels in mathematics. Thus, the program is meeting its proposed student achievement objectives. In English, gains were statistically significant in all language subtests for all grade levels in which students were pretested and posttested with the same test level. In native language, results were varied by grade level and language subtest. Generally, gains achieved by fourth,

seventh, and eighth graders were statistically significant; whereas gains achieved by fifth graders were not. Students tended to score high at pretest and, therefore, the possibility to show gain was restricted. In mathematics the results were inconsistent across grade levels. Only fourth- and seventh-grade students are making statistically significant gains. However, all but sixth- and eighth-grade students are averaging above the national norm at posttest.

In science, student performance could not be evaluated because students were not tested.

RECOMMENDATIONS

The following recommendations are offered for possible program improvement:

1. Since the project will be completing its last year of Title VII funding next year, strategies need to be developed to expand its role within the two districts and beyond the four school sites. Communication through district superintendents to more principals about the positive attributes of the project, particularly the communicative approach to language learning integrated with content-area courses, might facilitate expansion. In addition, staff resources to disseminate the program model, including demonstrations by staff and participating teachers, could prove valuable.

2. The concept of teaching language as communication through topics presented in science and math has been successfully translated into educational practice. Consideration might be given to expanding this concept to other content areas, such as literature and social studies. The South Bronx Reconstruction Project might serve as an experimental model for such expansion. Topics on the social and cultural history, as well as the current literary and artistic activities of the area, could become themes for specific instructional units. Students would thereby become better informed about their own social and cultural background, and motivated to learn.

3. The method of creating situations in which all students have a chance to communicate and participate in ongoing learning activities -- such as the use of small groups -- was highly effective in the two classrooms observed. Continued emphasis on group cooperation and negotiation with corresponding deemphasis on competition and individual success (seen as independent of other students), is strongly recommended for the particular population served by Project MAS.

4. Although the degree of implementation as proposed was high in three of the four sites, staff development activities need to be adjusted to the less receptive classrooms at P.S. 27. Project staff might focus greater attention on this site by eliciting views of all involved participants, including the principal, classroom teachers, and parents. Further obervation of classrooms might provide valuable information regarding the particular needs of the children. If information collected in this way warrants, a set of specially devised modules can be adapted to the particular needs of the fourth site.

5. The performance of students on the instrument used to measure gains in Spanish suggests that the instrument is inappropriate. Students are scoring very high at pretest and, therefore, the possibility to demonstrate gains is restricted. The project might explore the use of a different instrument.

6. The project currently tests students in language and mathematics. Given project objectives for language development through both mathematics and science, it is recommended that student performance in science be assessed and student progress traced. In the absence of norm-referenced or citywide tests appropriate for this population, the project might consider project-developed or teacher-developed tests. The results would serve both to trace student progress and to evaluate program outcomes.

VIII. APPENDIX

APPENDIX A

Program Staff Characteristics: Professional and Paraprofessional Staffs

Function/ Funding Source	Percent Time Spent in Each Function	Date of Appt. to Each Function	Education (Degrees)	Certification	License(s)	Total Yrs. Experience Education	Years Experience Bilingual	Years Experience E.S.L.	Years Other Relevant Experience
Project Director Title VII	100%	9/82	M.A. Education M.A. Adm./Sup.	N.Y.C. N.Y.S.	D.H.S. E.A.	19	11	1	
Resource Teacher	"	2/83	M.A. Bil. Ed.	N.Y.C. N.Y.S.	B.C.B.	8	8	2	
Resource Teacher	"	9/84	M.A. Educatic.1	N.Y.C. N.Y.C.	B.C.B.	12	10		
Parent Trainer	"	11/82	Got credits in Education		Paraprofessional	9	6		
Paraprofessional	"	1/83	37 credits		"	10	7		
Paraprofessional	"	2/83	60 credits		"	1½	1		
Paraprofessional	"	2/83	37 credits		"	1½	1		
Paraprofessional	"	2/83	30 credits		"	1½	1		
Paraprofessional	"	2/83	27 credits		"	2½	1		

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